The Effects of Access to Health Services on Adult Health Status:

Evidence from Indonesia's "Midwife in the Village" Program

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Investigators: Duncan Thomas
Elizabeth Frankenberg

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For more information please contact:

The POLICY Project
The Futures Group International, Inc
1050 17th Street, Suite 1000
Washington, DC 20036
Telephone: (202) 775-9680
Facsimile: (202) 775-9694
E-mail: policyinfo@tfgi.com
Internet: www.policyproject.com

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Elizabeth Frankenberg*

Duncan Thomas**

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* RAND. 1700 Main Street. Santa Monica, CA 90407.
** RAND and the University of California at Los Angeles.

Abstract

This paper documents the impact on adult health status of expansion in access to midwifery services. In the early 1990s the Government of Indonesia began the Village Midwife (*Bidan Desa*) program to train midwives and place them in villages and townships throughout Indonesia. We use data from the 1993 and 1997 rounds of the Indonesia Family Life Survey. Between 1993 and 1997, the fraction of IFLS communities with a Village Midwife more than quadrupled, increasing from 10% to almost 45%. The statistical models that we estimate address the issue of non-random placement of midwives by examining change in health status as a function of whether the community gained (or lost) a Village Midwife. We measure health status as Body Mass Index (BMI), which is a standard measure of adult nutritional status. Our results show that for women under 50, increases in BMI were significantly more likely among those who lived in communities that gained a Village Midwife. Gaining a village midwife appears to have had no impact on men's health status or on the health status women over 50 as a group. Among women under 50, the largest effects of gaining a Village Midwife on BMI are observed for women in the lower quartile of the BMI distribution in 1993, for relatively younger women, and for women with relatively more education. In combination the results suggest that efforts of the Ministry of Health to rapidly expand access to midwifery services has had a pay off in terms of the health status of women of reproductive age.

1. Introduction:

Governments in most countries subsidize health care, at least for certain groups, in an effort to improve health status. These subsidies take a variety of forms, including placement of facilities in areas that are underserved, price subsidies, and outreach activities in remote areas.

This paper addresses the question of whether government efforts to provide health care have an impact on the populations that the programs target. We explore this question for Indonesia, a country in which over the past three decades there have been concomitant improvements in access to health care and in common metrics of health status such as life expectancy and the infant mortality rate.

Since late 1997 Indonesia has been experiencing an economic downturn. In a climate of shrinking resources for health care, information about which programs have been effective is at a

premium. We focus particularly on the Village Midwife (or *Bidan Desa* program) that began in the early 1990s. The program, which is described in more detail below, places trained midwives in villages and townships in an effort to increase women's access to reproductive health care.

The remainder of the paper is organized into five sections. The next two sections describe the Indonesian health sector and discuss statistical issues associated with evaluating program impact. Section 4 describes the data we use in our analyses and presents descriptive statistics. Section 5 describes our methodological approach and presents statistical results. We end with a section of conclusions.

2. Indonesia: Health Outcomes and the Health Service Environment

Over both the short and long term Indonesia has seen substantial changes in its level of socioeconomic development. In late 1997 Indonesia, like a number of other Southeast and East Asian countries, entered a period of financial crisis. For the first time in several decades, the economic growth rate in 1998 was actually negative: GDP contracted by an estimated 12-15% in 1998 (Far Eastern Economic Review, 1999). Growth in 1999 is expected to be near zero (Economist Intelligence Unit, 1999; Pangestu, 1999).

The past couple of years differ markedly from Indonesia's experiences over the previous three decades. From 1967 up through 1997 Indonesia experienced strong economic growth. During this period per capita GDP rose by an annual average of almost 5%. At the same time, considerable investments were made in human capital: nearly universal enrollment in primary school was attained and enrollment in secondary school rose five fold (from 10% to 50%).

Since the early 1960s, a number of indicators of health status in Indonesia have shown major improvements. The infant mortality rate has fallen steadily, and was estimated at 45.5 per 1000 live births for the 1992-1997 period (DHS Final Report, 1998). Life expectancy has also risen and was over 60 years in the mid-1990s. Another less frequently cited indicator of health

status is adult height. In cross-sectional data the mean height of adults increases steadily with year of birth, suggesting that young adults have grown up in much healthier conditions than did their parents (Strauss and Thomas, 1998). With respect to children's health, comparisons of survey data from 1978 and 1992 reveal that over this period, the fraction of children classified as malnourished fell substantially (MOH, 1993). These gains in health status are likely to reflect both general socioeconomic development and efforts of the GOI to expand access to primary health care (Gani, 1996; Kosen and Gunawan, 1996).

One dimension of health outcomes which has shown less impressive gains and over which the Indonesian government has evinced considerable concern is maternal mortality (Sweet et al., 1995; Handayani et al., 1997). The maternal mortality rate in Indonesia, which is estimated at 400-600 deaths per 100,000 live births, is the highest in any of the ASEAN nations (Mukti, 1996). In fact, Indonesia's rate is on a par with those in India and Bangladesh, despite the fact that GDP per capita in Indonesia is about 50% higher than in India and about twice as high as in Bangladesh, where income levels are substantially lower (Demographic Institute, 1997).

One of the programmatic efforts to address poor maternal health has been the ambitious Village Midwife program. Beginning in the early 1990s the Ministry of Health (MOH) began a program to rapidly extend the availability of midwifery services by posting midwives in underserved villages throughout Indonesia (Handayani et al., 1996; Radyowiyati and Sequeira, n.d.). Village midwives are charged with a number of duties, including provision of health and family planning services, promoting community participation in health, working with traditional birth attendants, and referring complicated cases to health clinics and hospitals (GOI, 1989). In some settings the midwives are provided with a Delivery Post, which functions as a maternity home within the village. In other settings the midwife has a small office within which she provides prenatal care and family planning services.

The Village Midwife program builds on the public health system that was put in place in the 1970s and 1980s. The backbone of this system at the community level is the public health center (*puskesmas*). The health center provides a range of services and is a basic source of subsidized outpatient care for both men and women across the age range. Health centers are generally headed by a doctor, who oversees a midwife and various paramedical workers (MOH 1990). Each subdistrict (consisting of 20-40 villages or townships) has one or more health centers.[1]

Staff members of the health center are responsible for implementing a number of outreach programs designed by the MOH. Since the 1980s the *Posyandu* (literally the Integrated Service Post but referred to here as a community health post) has been at the center of these efforts. The community health post is a monthly activity for children under five and their mothers. Community volunteers and often staff from the health centers attend. If health workers are present the posts generally provide prenatal care, immunization, and contraceptive injections. Otherwise services typically focus on the provision of vitamins, oral rehydration solution, nutritional screening and oral contraceptives.

Private practitioners are also an increasingly important source of health care in Indonesia (Berman, Sisler, and Habicht 1989; Streatfield, Tanpubulon, and Surjadi 1990). Generally private services are more available in urban than in rural areas (Brotowasisto et al. 1988; World Bank 1990). However, employees of the health center can offer private services when the health center is closed, so private practitioners can be found in most rural areas as well.

[1] In addition to health centers, *puskesmas pembantu* (subcenters) are located in the more peripheral villages of subdistricts in which travel is difficult. There is considerable heterogeneity in the sophistication of services available from subcenters (MOH 1990; Berman, Ormand, and Gani 1987).

3. Evaluating the impact of health and family planning services on demographic outcomes

Although governments throughout the world subsidize access to health services because access to services is thought to improve health outcomes, strong positive impacts of access to care on health do not consistently emerge in the literature. One explanation for the lack of consistent effects is that the distribution of health services is not random with respect to health outcomes of interest. For example, public health care may be aimed at the poor, who have relatively poor health, producing a negative association between health status and access to health services. Rosenzweig and Wolpin (1986) demonstrate this phenomenon in an analysis of the effects of health and family planning programs on the (standardized) height and weight of Filipino children. Results from a cross-sectional regression of height and weight of children on the presence of the programs in the children's villages reveals a statistically insignificant inverse relationship between the presence of both programs and children's nutritional status. In contrast, there are positive and significant associations between program presence and height and weight when children's change in nutritional status is regressed on length of exposure to the programs. The authors attribute the differences in results across the models to the nonrandom placement (and timing of placement) of clinic services.

With respect to Indonesia, several studies have documented the potential of endogenous program placement to bias estimates of program impact. The distinction between cross-sectional and change-based specifications and their attendant results appears in studies of fertility (Gertler and Molyneaux, 1994) and child mortality (Frankenberg, 1992) in Indonesia. Frankenberg finds that increases in the availability of private doctors' and midwives' clinics significantly reduces the risk of infant mortality. In another analysis of Indonesian data, Pitt, Rosenzweig, and Gibbons (1993) show that the estimated cross-sectional effects of public programs on the aggregated cumulative child mortality experiences of women 25 to 29 years old differ from those

obtained when changes in subdistrict mortality rates over time are treated as a function of changes in access to care within that subdistrict.

4. Data

The data we use for this study are from two rounds of the Indonesia Family Life Survey (IFLS). The IFLS is a panel survey of individuals, households, communities, and facilities. The first round of data (IFLS1) was collected in 1993 and included interviews with 7,224 households and with 22,347 of the some 30,000 individuals within those households (in IFLS1, by design, not all household members were interviewed) (Frankenberg and Karoly, 1995). The IFLS is representative of about 83% of the Indonesian population.

In 1997 a resurvey was conducted of the IFLS1 individuals, households, communities, and facilities. This survey (IFLS2) sought to reinterview all IFLS1 households (and all members of these households in 1997) as well as a set of target members of IFLS1 households in 1993 who had migrated out by 1997 (Frankenberg and Thomas, 1999). The survey succeeded at reinterviewing 94% of IFLS1 households and 91% of target individuals.[2]

The household and individual questionnaires for the IFLS cover an array of topics that are central to the questions we address. In addition to detailed data on socioeconomic status, the IFLS contains extensive measures of health status. IFLS2 included a number of physical assessments that were collected by a nurse who traveled with the interviewing team. The nurse conducted assessments of height, weight, hemoglobin level, blood pressure, lung capacity, and lower body motion. In 1993 data on height and weight were collected.

[2] The IFLS2 was directed by Elizabeth Frankenberg and Duncan Thomas. It was a collaborative project of RAND, UCLA, and the Demographic Institute of the University of Indonesia, conducted with funding from the National Institute on Aging, the National Institute of Child Health and Human Development, The Futures Group (the POLICY Project), the Hewlett Foundation, the International Food Policy Research Institute, John Snow International (the OMNI Project), USAID, and the World Health Organization. The IFLS1 was directed by Elizabeth Frankenberg, Paul Gertler, and Lynn Karoly. It was a collaborative project of RAND and the Demographic Institute of the University of Indonesia, conducted with funding from the National Institute of Child Health and Human Development, USAID, the Ford Foundation, and the World Health Organization.

Table 1 presents summary statistics on various measures of health status in 1993 and 1997, for both men and women. In both 1993 and 1997 respondents were asked to evaluate their general health status on a four-point scale (very good, good, fair, poor). For both women and men there have been nontrivial decreases in the fraction who report themselves to be in good health, and increases in the fraction who report themselves to be in poor health (these changes are all statistically significant). Changes in Body Mass Index (BMI), however, contradict the suggestion that health has worsened over the period. BMI, the ratio of weight in kilograms to the square of height in meters, has increased on average for both women and men. These changes are also statistically significant. There have been no significant changes in the fraction of women or men whose BMI is less than 18 (a cut-off typically used to indicate dangerously low levels of BMI).[3]

BMI is the only physically-assessed measure for which data are available in both 1993 and 1997. However, several additional physical assessments were collected in 1997. The data on hemoglobin suggest that almost 9% of women, and 3.4% of men were severely anemic in 1997. If the indicator for moderate levels of anemia are used, the fractions rise to 38% and 15.6% for women and men respectively.

In addition to the individual and household data, each wave of the IFLS has collected detailed information about the 321 IFLS communities through interviews with the village leader (and his or her officials) and the head of the village woman's group; and through visits to health

[3] BMI of lower than 18 has been shown to be associated with higher adult mortality (Waaler, 1984; Fogel, Costa, and Kim, 1992). Using data from the IFLS1, Thomas relates self-reported health status to BMI. He finds that for individuals with BMIs of 22 or higher, there is no relationship between self-reported health status and BMI. For individuals whose BMI is less than 22, the fraction reporting themselves to be in poor health rises as BMI falls.

facilities and schools that are available to community residents.[4] These data provide a means for measuring access to the programs and service providers described above.

In this paper we explore the impact of access to health care on health outcomes, focusing particularly on the role of the Village Midwife program. However, because the Village Midwife program is not the only aspect of the health environment that may have changed during the 1990s, it is important to control for other dimensions of the health service environment, and for levels of infrastructure more generally. We construct measures of access to public services, strength of the outreach programs of public clinics, access to services from community programs, and access to private services. We also construct measures of physical infrastructure not directly related to the health service environment.

Table 2 summarizes aspects of the health service environment and the physical infrastructure environment more generally. Access to the Village Midwife program is measured as whether or not a Village Midwife was available in each year of the survey. Access to public clinics is measured as the distance from the community to the nearest health center, while access to private services is measured as the distance from the community to the nearest private practitioner.[5] With respect to access to outreach efforts, we construct a variable indicating whether or not the community receives monthly visits from health center staff. With respect to the strength of community interventions, we construct a variable measuring whether or not the community has a health post that offers iron tablets. Physical infrastructure is measured by

[4] The administrative structure in Indonesia is the similar across urban and rural areas. The lowest level over which a civil servant presides is the desa (in rural areas) or the kelurahan (in urban areas). Literally these words translate into village and ward. In the IFLS community data collection strategies do not vary by urban/rural classification.
[5] Data on the availability of services is collected through a Service Availability Roster (SAR). The SAR lists each facility (public or private) mentioned by a household member as an option for care. The community leader is then asked to provide information on the distance, travel time, and cost associated with reaching that facility.

whether the community's main road is paved and whether a public phone is located in the community.[6]

The results in Table 2 indicate that the Village Midwife program expanded massively between 1993 and 1997. In 1993 only about 10% of IFLS communities had a Village Midwife. By 1997, a full 44% of IFLS communities did. In terms of changes, 38% of IFLS communities gained a midwife, while 3.2% lost their midwives.

The data also suggest that the strength of the community health posts and of health center outreach to these posts declined. In 1993, over 93% of communities had at least one health post that offered iron pills. In 1997 the fraction of communities had fallen to 81.4%. The net change is a result of the fact that 5.8% of communities gained a health post with iron tablets, while 17.5% of communities lost a post with iron tablets. In terms of outreach from health clinic staff, the fraction of communities that reported receiving monthly visits from clinic staff fell from 95.6% to 88.0%. Only about 3% of communities gained a monthly visit, while 10% of communities lost visits.

The basic measures of access to public and to private services— distances to the closest public and private facilities—change little between 1993 and 1997. In 1993 the median distances to public and to private facilities were 1.1 and .3 kilometers respectively. In 1997 the median distances were 1.1 and .2. About half the communities had a public phone in 1997, up from 44.7% in 1993. Between 1993 and 1997 almost 14% of communities gained a paved road, bringing the total fraction of communities with a paved road to 85.1%

In considering how access to services affects behaviors or outcomes, one must confront the possibility that services are systematically placed in order to increase the likelihood that they reach people with particular characteristics. For example, health centers or outreach efforts by

[6] Communities with a pay phone are generally quite well-off on other dimensions of development, while communities in which the main road is not paved are generally relatively poor.

public clinics may be targeted toward areas where health conditions are known to be bad or the population is thought to be poor. Failure to take account of these placement strategies in estimating the impact of access to services on behaviors and outcomes will result in biased estimates of the impact of services.

The IFLS community data provide information on a number of aspects of socioeconomic development at the community level. The IFLS household data can be aggregated to provide information on health status within the community. We use community-level data to explore how aspects of socioeconomic development and health status in 1993 are associated with access to services and with changes in access to services between 1993 and 1997.

The question we ask is whether the health service environment is correlated with or appears to respond to community levels of socioeconomic development and health status. The dependent variables in these analyses are indicators of the level of services in 1993 and of change in services between 1993 and 1997. Level of socioeconomic development is measured by whether the community has a public phone, and whether the main road in the community is paved. Because measures of economic development at the community level tend to be highly correlated, we test for the joint significance of the measures with an F-test. Health status at the community level is measured as the percentage of community residents whose Body Mass Index is less than 18 and as the mean height-for-age z-score of children less than 10. A high proportion of adults with BMI below 18 is associated with poor health status, while a high average z-score is associated with good health status.

The results are presented in Table 3. The first three columns focus on the Village Midwife program, exploring the correlates of having a Village Midwife in 1993, of gaining a Village Midwife by 1997, and of losing a Village Midwife by 1997. Recall from Table 2 that in 1993, only about 10% of communities had a Village Midwife. Communities in which the main

road was paved are significantly less likely to have had a Village Midwife in 1993. The presence of a public phone is also negatively associated with the presence of a Village Midwife, and in combination, the development indicators are highly significant. The health status indicators are not significant, either jointly or individually.

Almost 38% of IFLS communities gained a Village Midwife between 1993 and 1997. The results in the second column suggest that the communities that gained a Village Midwife were more likely to have residents with poor nutritional status in 1993 and were more likely to have low levels of socioeconomic development in 1993. About 3% of IFLS communities lost a Village Midwife between 1993 and 1997. Neither the health nor the development measures are significantly correlated with losing a Village Midwife, suggesting that this process may have been random.

Columns 4-6 of Table 3 refer to whether a health post that offers iron tablets is available in the community. In 1993, about 8% of communities had no health posts that offered iron tablets. These communities appear to have been communities in which nutritional status was higher than average but in which levels of socioeconomic development were relatively low. Most of the communities that did not have a post with iron tablets in 1993 did have a post that offered iron tablets by 1997. Not surprisingly, then, the communities that gained posts with iron tablets have the same characteristics as the communities that did not have posts with iron tablets in 1993: relatively high nutritional status combined with relatively low levels of socioeconomic development. A sizeable fraction of IFLS communities lost health posts with iron tablets by 1997 (17%), but losing these posts does not seem to be associated with either levels of either economic development or nutritional status in 1993.

The last three columns of the table present the results for whether communities received monthly visits from health center staff. In 1993, only 4% of IFLS communities reported that

they did not receive monthly visits. Neither failure to receive monthly visits nor gaining a monthly visit by 1997 is associated with indicators of nutritional status or level of socioeconomic development. However, the 10% of IFLS communities that lost monthly visits between 1993 and 1997 appear to have been the communities in which levels of socioeconomic development were lower than average (for example, communities without a paved road).

Community health posts and outreach services from public health centers were well-established by 1993. Between 1993 and 1997 it appears that these aspects of the health service environment deteriorated to some extent. There is no evidence to suggest that changes in these dimensions of the health service environment reflect explicit policies of the Ministry of Health, but some of the changes do not appear to be random. Specifically, there is a strong pattern in terms of the types of communities that gained health posts with iron tablets, and it appears that the loss of monthly outreach visits is more likely in more remote communities.

The patterns with respect to the Village Midwife program are quite different. In 1993 Village Midwives were relatively rare. Between 1993 and 1997 a sizeable number of communities gained Village Midwives. Which communities gained midwives does appear to reflect explicit allocation policies on the part of the Ministry of Health. Specifically, communities with lower 1993 levels of both nutritional status and infrastructure were particularly likely to have a Village Midwife posted to them by 1997.

The results presented in Table 3 suggest that correlations at a point in time between characteristics of the health service environment and health outcomes will be biased by failure to address the systematic nature of placement of the midwives. In the next section we discuss the statistical models that we estimate in an effort to correct for the potential biases that result from non-random program placement.

5. Methods and Results

One of the ways in which non-random program placement can be addressed is by analyzing whether changes in the health service environment are related to changes in health outcomes. We pursue this strategy. By examining changes in health at the individual level as a function of changes in health programs, we hold constant aspects of the community in which an individual lives that may affect both access to services and health status.[7] Because height and weight are the only physical health assessments that IFLS1 collected, we are limited to Body Mass Index as an indicator of health status.

The model that we estimate is an OLS regression in which the dependent variable is the difference between Body Mass Index in 1997 and BMI in 1993. Positive values of the dependent variable represent a positive change in health status between 1993 and 1997.[8] The covariates are included as changes between 1993 and 1997 in the characteristics of the health and broader socioeconomic environment.

The first specification from which we present results regresses change in BMI between 1993 and 1997 as a function of the following covariates:

1) change in per capita expenditure (log of) between 1993 and 1997
2) gaining or losing access to a Village Midwife
3) gaining or losing monthly visits (to the community) by health center staff
4) gaining or losing access to a health post that distributes iron tablets
5) change in proximity to the nearest public health clinic (increasing values are associated with closer proximity in 1997 than in 1993)
6) change in proximity to the nearest private health clinic (increasing values are associated with closer proximity in 1997 than in 1993)
7) gaining access to a paved main road

[7] If program placement is a response not to fixed aspects of the community but to changing characteristics, then the estimation strategy outlined above will not address the problem. We explored whether change in access to Village Midwives between 1993 and 1997 was related to changes in health status prior to 1993. We measured change in health status at the community level as the difference between the average height-for-age Z-score for children age 5-9 in 1993 and the average height-for-age Z-score for children age 0-4. Early childhood nutrition is an important component of children's height at older ages. Therefore, communities in which the z-scores of the youngest children in 1993 are relatively higher than the z-scores of their older counterparts are likely to be the communities in which health status has improved.

[8] A positive change in BMI indicates weight gain between 1993 and 1997, which in a population where two-thirds of adults have BMIs of less than 22, is likely to be health-improving.

8) gaining access to a public telephone

The covariates are specified so that the interpretation of a positive sign on a coefficient is that an increase in the variable is associated with a positive change in health status. Table 4 presents the results for all women (column 1), for women stratified by age (20-34 years in column 2, 35-49 years in column 3, and 50 or more years in column 4) and for men (column 5).[9]

The second row of the table presents the coefficients for the variable measuring whether a Village Midwife moved into the community between 1993 and 1997. The effect of gaining a Village Midwife is significant and positive, indicating that adding a Village Midwife significantly enhances women's health status, at least as measured by Body Mass Index. When women are stratified by age (columns 2-4), the coefficient on gaining a Village Midwife is large and positive for women in their reproductive ages. The increase in BMI associated with gaining a midwife is largest for the youngest women, and only slightly smaller for women 35-49 years old. However, for women older than 50, there is no impact on BMI of gaining a midwife. Nor is there any impact on BMI of gaining a midwife for men.

In combination these results suggest that the Village Midwife program has positively affected the health status of the group toward whom it is targeted: women of reproductive age. The fact that the positive effects of the program are limited to reproductive-age women adds strength to the argument that the association is causal, rather than arising from some other spurious factor that has changed concomitantly with changes in access to Village Midwives (if such a factor were driving the improvements in health status, it would likely affect both women and men, rather than only reproductive-age women).

[9] When observations with missing values are eliminated, data are available for 5321 women and 3883 men. We restrict our analysis to individuals at least 18 years of age in 1993.

As noted in Table 2, a small fraction of communities had a Village Midwife in 1993 but no longer had one by 1997. Losing a Village Midwife appears to have a negative impact on change in BMI for women 20-34 and for men.

Change in access to Village Midwives is the only factor we include in our model that reflects a formal policy-driven change in the health service environment. While other changes in the health service environment of particular communities have occurred (as is illustrated in Table 2), these changes affect a far smaller fraction of communities and do not represent manifestations of explicit policies or policy changes. Nevertheless, we control for these other types of changes, several of which appear to be related to changes in BMI.

One of these changes is proximity to a public health center. Increasing proximity to a center in 1997 relative to 1993 is associated with a positive and significant change in BMI—for all women and for women in each age group. While being relatively nearer to a health center in 1997 than in 1993 appears to be good for health status, living in a community that gained a monthly visit from health center staff does not emerge as a significant predictor of change in BMI. Losing monthly visits from health center staff is negatively associated with change in BMI for the oldest women, but not for other demographic subgroups.

Some of the relationships that emerge in Table 4 are likely to be a function of dynamics other than a causal relationship between the particular factor and change in BMI. For example, for each group for whom the model was estimated, gaining a health post that distributes iron tablets is strongly negatively associated with change in BMI. This result arises because the only communities without health posts distributing iron in 1993 (and thus the only communities eligible to gain posts distributing iron by 1997) were those that were relatively well-off (in terms of paved roads and access to public phones) and where BMI was already relatively high. It seems unlikely to us that gaining a health post that distributed iron tablets actually depressed

BMI for men and women of all ages, but rather that larger than average increases in BMI were unlikely in areas where health status was good. A similar argument may explain the negative coefficient on proximity to private practitioners. Proximity to private practitioners may have increased in areas where BMI was relatively high already and thus unlikely to increase substantially between 1993 and 1997.

Table 4 presents results for both men and women and for women stratified by age. The results suggest that it is women, particularly women of reproductive age, who have been most affected by the expansion of the Village Midwife program.

We can further explore whether the effect of gaining a Village Midwife varies across different types of reproductive age women by including interaction terms between gaining a Village Midwife and factors such as age and education. Results from these types of regressions are presented in Table 5.

The first column presents estimates from a specification that includes interactions between gaining a Village Midwife and a woman's age and between gaining a Village Midwife and a woman's educational level. The interaction between gaining a Village Midwife and level of education is positive, suggesting that the positive effect of Village Midwives on change in BMI is greater for the better-educated than for the less well-educated.

A priori it is not clear which direction such an effect should go. One interpretation of the result we obtain relates to the fact that these midwives are relatively new to the village. By definition they have been in residence less than four years, since they came to the village after 1993. The services they offer are different and more expensive than the services offered by traditional birth attendants. Possibly the better-educated women are relatively "braver" about trying out their services than are the less well-educated.

This interpretation is consistent with results from focus groups that were conducted in preparation for the IFLS survey. When asked to give reasons for preferring the services of traditional midwives (*dukun*) to midwifes with more biomedical training (*bidan*) less-educated rural women said that they felt uncomfortable with "non-traditional" midwives and frightened by the procedures they used. Women with more education expressed fewer of these concerns and seemed more open to the practices and messages of *bidan*.[10]

Other research documents the important role that community leaders play in facilitating the work of the Village Midwives and in encouraging community members to use their services (Istiarti, 1996). If influential figures in the community "lead by example", it may explain why we find that in the first years of the program the presence of a Village Midwife appears to have the greatest benefits (in terms of BMI) for the better-educated.

The interaction between gaining a Village Midwife and age is negative, which implies that the health-enhancing effects of Village Midwives decline as women get older. This finding in intuitive, since the services that Village Midwives typically offer (prenatal, delivery, and well-baby care in addition to family planning services), are particularly likely to be needed by younger women.

The results described above suggest that the positive impact on health status of gaining a Village Midwife is relatively larger for younger women and for women with relatively more education.

Another question we ask is whether the effect on change in BMI of gaining a Village Midwife varies depending on initial health status. That is, does gaining a Village Midwife most improve the health of those "most in need"? To address this question we contrast the impact of

[10] Considerable research has been done in Indonesia on women's reasons for preferring *dukun* to *bidan* for assistance during childbirth (Istiarti, 1996; Handayani et al., Radyowiyati and Sequeira, n.d., The Demographic Institute, 1997b). These studies find that a number of factors are at work. Dukun are cheaper, they can be paid in

gaining a Village Midwife for women who were in the lowest quartile of BMI in 1993 with the impact of gaining a Village Midwife for women who were in the upper three quartiles of BMI in 1993.[11]

These results are presented in the 2nd column of Table 5. The impact on change in BMI of gaining a Village Midwife for those in the lowest quartile of BMI in 1993 is more than double the impact for women in the upper three quartiles of BMI. These results provide strong evidence that the program has been of greatest benefit to women for whom a positive change in BMI is most health-enhancing.

The regression coefficients can by used to calculate the predicted improvement in BMI associated with gaining a Village Midwife, for women above and below the 25% threshold. Among women in the upper three quartiles of BMI in 1993, the median BMI was a healthy 22.6. For these women, gaining a Village Midwife is associated with an increase in BMI of .15. Given that these women were already at a healthy level of BMI, the increase associated with gaining a Village Midwife may or may not improve health.

Among women in the lowest quartile of BMI in 1993, the median level of BMI was 18.5—the cutoff below which individuals are defined as underweight. For these women, gaining a Village Midwife was associated with a gain in BMI of .346. This predicted increment to BMI pushes them out of the under-weight classification—a change that is almost certainly health-enhancing.

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kind and over time, they perform traditional rituals and ceremonies associated with pregnancy and birth, and they provide more care during the postnatal period.

[11] In 1993, 25% of women had BMI's of less than 19.6.

6. Conclusions

This paper has sought to document the impact on adult health status of expansions in health services, using data from a period in Indonesia during which expansions in access to a particular type of health service was rapid.

In the early 1990s the Government of Indonesia began a program to train midwives and place them in villages and townships throughout Indonesia. The Village Midwife program was implemented to address concerns about the maternal mortality rate and also as a general means of increasing access to health services, particularly for women and children.

Using data from two rounds of the IFSL, we document a substantial increase over time in access to Village Midwives. Between 1993 and 1997, the fraction of IFLS communities with a Village Midwife more than quadrupled, increasing from 10% to almost 45%. Examination of the relationship between community-level health status and socioeconomic development in 1993 and whether a community gained a Village Midwife by 1997 suggests that communities where nutritional status and level of infrastructure in 1993 were relatively low were particularly likely to gain a Village Midwife by 1997.

The statistical models that we estimate address the issue of non-random placement of midwives by examining change in health status as a function of whether the community gained (or lost) a Village Midwife. We measure health status as Body Mass Index (BMI), which is a standard measure of adult nutritional status. On average, the BMI of adults in Indonesia increased between 1993 and 1997.

Regressions of change in BMI as a function of change in access to a Village Midwife show that for women under 50, increases in BMI were significantly more likely among those who lived in communities that gained a Village Midwife. Gaining a village midwife appears to have had no impact on men's health status or on the health status women over 50 as a group.

Among women under 50, the largest effects of gaining a Village Midwife on BMI are observed for women in the lower quartile of the BMI distribution in 1993, for relatively younger women, and for women with relatively more education. In combination the results suggest that efforts of the Ministry of Health to rapidly expand access to midwifery services has had a pay off in terms of the health status of women of reproductive age.

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Table 1
Indicators of Adult Health Status in 1993 and 1997

	1993		1997
Women			
Body Mass Index	21.67		22.15
Change in Body Mass Index			.48
% with BMI < 18	13.4%		12.7%
% with BMI < 22	59.7%		53.4%
Hemoglobin			12.3
% with Moderate Anemia (hemoglobin<12)			38.0%
% with Severe Anemia (hemoglobin<10)			7.2%
% who report themselves in good health	14.8		14.6
% who report themselves in bad health	11.9		27.1
N		5321	
Men			
Body Mass Index	20.9		21.1
Change in Body Mass Index			.20
% with BMI < 18	12.9%		13.6%
% with BMI < 22	71.1%		67.8%
Hemoglobin			13.7
% with Moderate Anemia (hemoglobin<12)			15.6%
% with Severe Anemia (hemoglobin<10)			3.4%
% who report themselves in good health	15.4		6.7
% who report themselves in bad health	11.4		14.6
N		3883	

IFLS1 and ILS2. Individuals at least 18 years old in 1993.

Table 2
Access to Health Care and the Health Outreach Programs in 1993 and 1997

% of communities	1993	1997
With a Village Midwife	10.1%	44.3%
Gained a Village Midwife		37.5
Lost a Village Midwife		3.2
With health posts with iron pills	93.2	81.6
Gained a health post with iron pills		5.8
Lost a health post with iron pills		17.5
Received monthly visits from health center staff	95.5	88.4
Gained monthly visits		2.9
Lost monthly visits		10.4
Median distance to health clinic	1.1	1.1
Median distance (km) to a private practitioner	.3	.2
With a public telephone	44.7	51.8
Gained a public telephone		12.0
Lost a public telephone		4.9
With a paved (main) road	71.5	85.1
Gained a paved (main) road		13.6

These statistics are based on data from the 309 communities that contribute individual level observations to our analyses. Three communities were excluded because physical health assessments were not conducted in one of the survey years. An additional nine communities were excluded because no individual in the community had all the data necessary for both years.

Table 3
Community Level Correlates of the Health Service Environment in 1993 and in Changes in the Health Service Environment by 1997

	Midwife in the Village			Health Post with Iron Pills			Monthly Visits from Health Center Staff		
1993 Community Characteristics	Have Midwife	Gain Midwife	Lose Midwife	No Post with Iron	Gain Post with Iron	Lose Post with Iron	No Monthly Visits	Gain Monthly Visits	Lose Monthly Visits
Body Mass Index	-1.949	4.805**	-1.255	-4.739*	-3.107	-0.546	0.315	3.547	-0.037
	(2.375)	(1.715)	(4.367)	(2.59)	(2.794)	(1.924)	(3.581)	(4.483)	(0.577)
Height for Age	0.560	-1.049**	1.012	1.815**	1.655**	-0.085	-0.487	-0.606	0.381
	(0.586)	(0.413)	(0.933)	(0.674)	(0.730)	(0.450)	(0.843)	(1.064)	(0.577)
Public Phone	-0.759	-1.235**	1.271*	-1.696**	-1.602**	0.059	0.894	0.860	-0.179
	(0.514)	(0.316)	(0.900)	(0.620)	(0.676)	(0.361)	(0.716)	(0.898)	(0.499)
Paved Road	-1.102*	-0.090	-1.177	-1.304**	-1.157**	0.253	-0.997	-0.888	-1.315**
	(0.440)	(0.301)	(0.891)	(0.487)	(0.520)	(0.386)	(0.680)	(0.822)	(0.446)
Constant	0.405	-3.367	-0.957	3.827	2.811	-1.843	-3.75	-5.506	-0.444
	(1.447)	(1.062)	(2.37)	(1.60)	(1.721)	(1.162)	(2.25)	(2.846)	(1.444)
F statistic for Health Indicators	1.84	15.50**	1.36	11.92**	7.26**	0.10	0.34	1.03	0.45
F statistic for Development Indicators	12.27**	17.55**	2.56	19.82**	14.50**	0.75	2.62	1.49	11.32**

Table 4
Correlates of an Increase in Body Mass Index for Individuals at least 18 Years Old in 1993

	All Women	Women 20-34	Women 35-49	Women 50+	All Men
	(1)	(2)	(3)	(4)	(5)
Increase in (log of) per capita expenditure	-0.019	0.079	-0.011	-0.015	-0.018
	(0.027)	(0.060)	(0.045)	(0.037)	(0.025)
Gain village midwife	0.096*	0.214*	0.185**	-0.084	-0.042
	(0.054)	(0.113)	(0.087)	(0.084)	(0.051)
Lose village midwife	-0.163	-0.491	-0.060	0.070	-0.336**
	(0.144)	(0.300)	(0.249)	(0.209)	(0.147)
Gain monthly visit from health center staff	0.053	0.394*	0.103	0.097	0.097
	(0.138)	(0.337)	(0.239)	(0.185)	(0.131)
Lose monthly visit from health center staff	-0.209**	-0.221	-0.081	-0.360**	-0.009
	(0.086)	(0.188)	(0.131)	(0.135)	(0.078)
Gain a health post that distributes iron tablets	-0.334**	-0.450*	-0.307*	-0.347*	-0.209**
	(0.108)	(0.203)	(0.182)	(0.173)	(0.097)
Lose a health post that distributes iron tablets	0.141**	0.350**	0.072	0.117	0.056
	(0.069)	(0.149)	(0.107)	(0.106)	(0.063)
Change in distance to a public health clinic	0.067**	0.075*	0.061**	0.079**	0.017
	(0.018)	(0.036)	(0.028)	(0.028)	(0.016)
Change in distance to a private health practice	-0.077**	-0.118**	-0.110**	-0.002	-0.087**
	(0.020)	(0.039)	(0.034)	(0.029)	(0.017)
Gain Paved Road	-0.017	-0.047	-0.014	-0.012	-0.009
	(0.067)	(0.144)	(0.106)	(0.105)	(0.063)
Gain public phone	-0.008	-0.066	0.250*	-0.193*	0.161**
	(0.078)	(0.166)	(0.129)	(0.117)	(0.074)
Lose public phone	0.148	0.138	0.196	0.056	0.025
	(0.116)	(0.240)	(0.182)	(0.183)	(0.108)
Constant	0.378**	1.271**	0.441*	0.019	0.123
	(0.160)	(0.390)	(0.277)	(0.225)	(0.153)
N	5321	1381	2030	1910	3883

The dependent variable is specified as BMI(97)- BMI(93).

Table 5
The Effect of Gaining a Village Midwife by Age, Education, and BMI in 1993
Women Age 18-49 in 1993

	Age and Education Interactions	Interaction with Level of BMI in 1993
Increase in (log of) per capita expenditure	0.025	0.024
	(0.036)	(0.036)
Gain village midwife	0.693**	
	(0.244)	
Lose village midwife	-0.235	-0.236
	(0.191)	(0.192)
Gain monthly visit from health center staff	0.182	0.217
	(0.197)	(0.196)
Lose monthly visit from health center staff	-0.136	-0.159
	(0.108)	(0.108)
Gain a health post that distributes iron tablets	-0.354	-0.349**
	(0.134)	(0.134)
Lose a health post that distributes iron tablets	0.180	0.172**
	(0.088)	(0.088)
Change in distance to a public health clinic	0.068**	0.064*
	(0.223)	(0.023)
Change in distance to a private health practice	-0.110**	-0.110**
	(0.026)	(0.026)
Gain Paved Road	-0.024	-0.038
	(0.086)	(0.085)
Gain public phone	0.110	0.137
	(0.102)	(0.101)
Lose public phone	0.172	0.186
	(0.146)	(0.146)
Gain Village Midwife * Education	0.032**	
	(0.013)	
Gain Village Midwife * Age	-0.019**	
	(0.007)	
Gain Village Midwife if '93 BMI in Lowest Quartile		0.346**
		(0.101)
Gain Village Midwife if '93 BMI in 3 Upper Quartiles		0.150**
		(0.075)
Constant	0.771	0.764
	(0.220)	(0.221)
N	3411	3411